

# Developing a Carbon Capture Student Competition

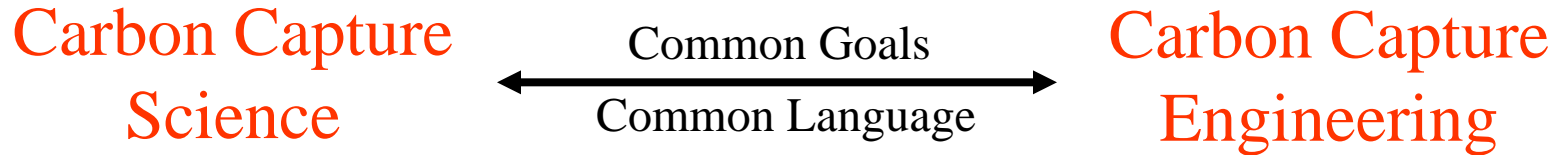
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# Purpose of Competition



- Attract undergraduate students to careers in energy, sustainability and environment
  - Expose students to applications of fundamental engineering and science principles that will encourage (and excite) them to choose BS level careers that will impact our ability to capture and store carbon dioxide, as well as minimize the production of greenhouse gases
  - Expose students to research opportunities that will encourage (and excite) them to choose research careers that will impact our ability to capture and store carbon dioxide, as well as minimize the production of greenhouse gases

# Challenge Project

- Approach:

- Industry/academic panel sets a specific problem
- Individuals or groups of students submit solution
- Panel judges entries based on specified criteria

- Advantages:

- Open to students with a broad range of talents & career goals
  - Terminal BS students as well as those seeking advanced degrees
- Suitable for a senior capstone course
  - Required or voluntary (select from several projects)
- Suitable for interdisciplinary living and learning programs
- Consistent with current design competitions

- Disadvantages:

- Single problem could be biased toward a specific discipline
- May need to develop several discipline specific problems

# Student Paper Award

- Approach:
  - Solicit papers from students doing research or working on faculty defined class projects relevant to carbon capture
  - Panel judges entries based on specified criteria
- Advantages:
  - Encourages the best and brightest who are most likely to seek advanced degrees
  - Easily implemented across disciplines
  - Consistent framework with undergraduate research experience and internship programs
  - Readily extended to graduate students
- Disadvantages:
  - May not reach the average student who wants to work in a plant or field environment
  - May be limited to students working for faculty funded by DOE

# Implementation

- Who sponsors the competition?
  - FE/NETL, BES, specific programs
- Who selects panel members and runs the competition?
  - DOE and its affiliates
  - Professional societies
  - Independent contractor/consortium
    - [International Genetically Engineered Machine competition \(iGEM\)](#)
- What is the prize?
  - Professional recognition
  - A check and certificate for the best. A copy of the “Carbon Capture Handbook” for the rest.

# Competition Topics??

- Design a scrubber or fluidized bed sorption and regeneration process for carbon capture
- Economic analysis of competing capture technologies
- Develop and/or implement rapid screening methods for potential capture materials
  - Simulation tools
  - Measure intrinsic thermodynamic, transport and reaction rate properties
  - Analysis of single particle transport and kinetic limitations
  - Characterize support structure for liquid impregnated sorbents and membranes
- Design and synthesize new capture materials
- Convert CO<sub>2</sub> to economically attractive products
- Breakthrough technologies for carbon abatement

# Faculty Competition??

- Challenge faculty to develop example problems specific to carbon capture, storage and abatement for inclusion in fundamental science and engineering courses
  - Use in class as applications of the theory; or as homework and/or exam problems
- Distribute the best submissions freely among faculty at all colleges and universities
- Implement via ‘Energy Summer School’ for faculty
  - Energy/environment principles to introduce new applications and provide new motivations for classical problems
- Cost effective since visibility and recognition are important at this level of effort

# What can we do today?

- Initial thoughts and comments
  - Who is our student audience?
  - What works? What does not work?
- Convey your further thoughts
  - Find me later or speak to workshop organizers
  - [richard.calabrese@hq.doe.gov](mailto:richard.calabrese@hq.doe.gov)
  - [rvc@umd.edu](mailto:rvc@umd.edu)
- Volunteer to participate in developing a rewarding student competition